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The DLA and DSCP sponsored Apparel Research Network (ARN) program's primary goals are to reduce total supply chain costs and inventory levels while minimizing retail shortages. The foundation for the achievement of these goals is the existence of a web accessible database that provides total supply chain asset visibility to all functions that make decisions or consume apparel items. PDIT's ARN assignments were to create the web accessible database, create decision support tools that utilize this database, and develop tools for use by apparel manufacturers that capture the data needed to fill voids in the total supply chain asset visibility picture. PDIT initiated three key projects to address these assignments. The ARN Asset Visibility System database (AAVS DataMart) was developed to create the central repository for total supply chain asset visibility. VIM (Virtual Item Manager) was created to provide visibility and decision support tools. ASAP (Automated Supplier Apparel Production) was developed to support apparel manufacturers while capturing order and shipment status data needed to make more informed decisions.

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Prepared for:

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Table of Contents

List of Figures

List of Tables

Appendices

A Acronyms
B ASAP Users Manual
C ASMweb Users Manual
D AAVS Users Manual
E AAVS DataMart Data Dictionary
F Required SAMMS Data Elements

Executive Summary

The DLA and DSCP sponsored Apparel Research Network (ARN) program's primary goals are to reduce total supply chain costs and inventory levels while minimizing retail shortages. The foundation for the achievement of these goals is the existence of a web accessible database that provides total supply chain asset visibility to all functions that make decisions or consume apparel items (see Figure 1). PDIT's ARN assignments were to create the web accessible database, create decision support tools that utilize this database, and develop tools for use by apparel manufacturers that capture the data needed to fill voids in the total supply chain asset visibility picture. PDIT initiated three key projects to address these assignments. The ARN Asset Visibility System database (AAVS DataMart) was developed to create the central repository for total supply chain asset visibility. VIM (Virtual Item Manager) was created to provide visibility and decision support tools. ASAP (Automated Supplier Apparel Production) was developed to support apparel manufacturers while capturing order and shipment status data needed to make more informed decisions.

Figure 1: Total Supply Chain Flow of Product, Orders, and Data

The AAVS DataMart is an integrated collection of data from a variety of legacy and ARN developed systems. The legacy system data provides part of the total supply chain data, e.g., contracts, requisitions, depot inventory levels, payment responsibilities, administrative offices, and manufacturing, retail, and wholesale addresses. The ARN developed systems provide the rest of the data about the total supply chain, e.g., retail and manufacturing inventory levels, retail consumption patterns, production status, and shipments. The current version of the AAVS

DataMart contains only Marine Corp utilized apparel items and data related to those items, e.g., retail addresses that received shipments of Marine Corp items. Completeness of data and consistency between sources of data was a significant problem that was addressed with PDIT developed screening software.

VIM is a collection of web accessible tools that utilize data from the AAVS DataMart to provide visibility and decision support. Current VIM tools provide views of retail assets, manufacturing production status, warehouse inventory levels at specific depots, retail and depot inventory valuations, and hyperlinks to a series of other ARN developed systems.

ASAP is a tool that is used exclusively by each defense apparel manufacturer to record production status and shipments to complete the picture of the total supply chain. It does this by accessing contract and product data to present each manufacturer with only their own specific subset of the information that they are responsible for. It facilitates the capture of the shipment data by utilizing the AAVS DataMart data to prepare most of the information needed to complete a DD Form 250. This reduces the time it takes each manufacturer to prepare their invoices and improves the quality and completeness of each invoices. The DD Form 250 is used as both an invoice and a packing slip.

The results of these efforts can be seen in the significant inventory reductions that have been seen at the Marine Corp Recruit Training Centers (RTC) and in the growth of the use of ASAP to capture production status and shipment data. Work is now underway to expand the capabilities of the tools, apply them to wholesale inventory reduction, and expand the AAVS DataMart to capture data for the rest of the services.

Introduction

This report provides a summary of the work done by PDIT for the ARN program for Delivery Order 0002 under Contract SP103-97-D-0024. All other documents produced for this contract (both CDRL and non-CDRL) are provided as appendices to this report. The primary objective for PDIT's work on this contract was to build a single complete supply chain database from a collection of heterogeneous legacy system databases and to make this data available over the Internet for anyone with an interest in some facet of the total supply chain. The visibility into the total supply chain provides the information required to make decisions that can both reduce inventory levels and shortages. The work that PDIT has done to achieve this objective is explained in the following five sections:

1. The first section identifies the ARN System Architecture using both operational and computer system architectures.

2. The second section identifies the structure and content of the AAVS DataMart, the legacy systems that provide the data, and the ftp sites that provide data to other ARN systems.

3. The third section identifies the extractions from the AAVS DataMart for a variety of ARN related applications.

4. The fourth section identifies the system developed by PDIT for the ARN program.

5. The fifth section reviews PDIT's AMA related efforts in support of Georgia Tech.

6. The sixth and final section provides summary level conclusions for this report.

1 ARN System Architecture

The ARN System Architecture can be viewed from either an operational or computer system infrastructure perspective. The operational architecture identifies each of the total supply chain functions, how they relate to each other, and what automated support systems they use. The computer system architecture identifies all the computer and communications related equipment and interfaces.

1.1 Operational Architecture

The ARN VPV Operational Architecture is depicted in Figure 1.1-1. The processing steps show the interrelationships of the retail, wholesale and manufacturing segments of the C&T supply chain and the ARN systems that support this process. Blue lines are used to indicate system function and document flow. Red lines are used to indicate the flow of data.
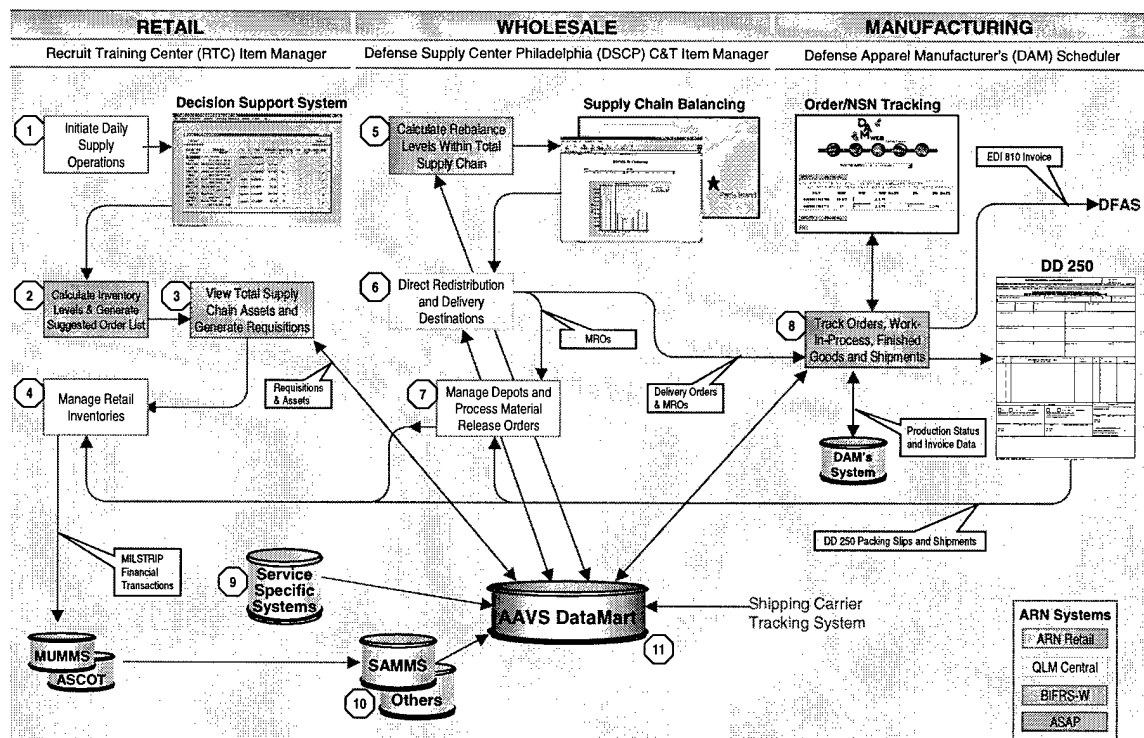
Figure 1.1-1: ARN Operational Scenario

Processing steps are identified by the numbers in white octagons and are described as follows:

1. The RTC Item Manager logs into the local inventory management and control system to initiate system functions and begin the daily supply cycle.

   The Item Manager may set or change the system's inventory management parameters. Among these is the Annual Shipping Plan, which represents the budgeted numbers of recruits beginning their training each week, and is entered into the system as soon as it is received.

Among the many other parameters that may be set are prices, option to order unit pack or exact number of each item, source of supply, and review of Reorder Objectives. Reorder Objectives represent the Safety Level Days, Reorder Point Days and Reorder Quantity Days.

2. Calculate Inventory Levels and Generate Suggested Order List: The Predictive Forecasting Module is initiated to establish the relationship between the predicted number of recruits and the reorder levels. The system will generate the revised reorder levels (Safety Stock, Reorder Point and Reorder Quantity) for each active item based on three variables. The first variable is the average daily usage per item. The second variable is the "Recruit Load Factor" which represents the increase or decrease of Recruit Activity over the average annual weekly activity for weeks T+2 through T+6. The final variables are the Reorder Objectives.

   The operator executes the program to compile a list of those items that need to be ordered. After compiling the list, the system will then display the items it recommends should be ordered. The operator then has the ability to add new items to the list, delete items from the list or change the suggested order quantity.

3. The RTC Item Manager may view asset data in the AAVS DataMart before finalizing orders to the DSCP. Supply chain assets may be reviewed by PGC and NSN for Requisition Status, Quantity On Hand, Quantity On Order, Prime Supplier Status, Work in Process, Finished Goods, and Carrier Shipping Status.

4. The local retail system performs the usual supply functions of requisition processing, receiving and issuing stock, cash sales, quality deficiency reporting, inventory adjustments, credits, warehouse denials, and physical inventory.

   The end of day close outs closes activity each day and prepares system for the next day's activity. Requisitions are processed into either a DSCP Requisition or a Local Purchase Order. The system extracts all MILSTRIP transactions generated during the current day's activity for upload into MUMMS or other legacy system.

   The system then extracts the daily activity currently required by AAVS DataMart. The data is separated into four tables. They are: Item Master which stores the summary of the activity by item; Daily Issues which contains all the issues for the day; Daily Receipts which contains all receipts entered for the day; and, Open Requisitions which contains all open DSCP Requisitions and Local Purchase Orders.

   Supply and financial transactions are transmitted each day in MILSTRIP format as required by MUMMS (USMC) and other services legacy systems

5. Calculations are made that analyze consumption and total supply chain inventories and existing orders required to rebalance the materials across the total supply chain. The DSCP Item Manager is shown the results of the analysis both graphically and in tabular form to either accept the results of the analysis or override it based on other knowledge. The Item Manager is responsible for initializing the negotiated production level for each DAM (Defense Apparel Manufacturer) for each of the PGCs that they have a contract to produce.

6. The DSCP Item Manager looks across the total supply chain to analyze demand, consumption, and stock locations to decide where and how much material should be positioned at the various retail and wholesale sites. The combination of balancing the supply chain and the analysis of retail demand and locations is used to develop recommendations to the DSCP Item Manager for delivery orders and material replenishment orders that directs the production and redistribution of materials. The Item Manager is responsible for setting a variety of parameters that guide the decisions made by the system, including parameters such as order of depot preferences for filling retail requisitions.

7. The Depots use SAMMS to record receipt of shipments, manage their inventories, and fill MROs (Material Release Orders).

8. Each DAM is responsible for receiving delivery orders with CLINs for specific NSNs. They use this information along with commitments for all other orders to schedule production for the newly received order. New orders become WIP (Work- In-Process) as soon as the first operation is performed to produce the garments. Once production is complete, the garments are inspected, packaged, and shipped with a DD 250 invoice and packing slip that is included in the shipment. The invoice data is formatted per the WInS (Web Invoicing System) requirements and transmitted to DFAS. Bill & Hold contracts require a DAM to hold off on the shipping activities until an MRO is received that instructs the DAM to ship the items to a specific location. The system is also capable of importing and exporting files for exchange with each DAM's internal systems for tracking production and managing their billings. DSCP Item Managers are responsible for authorizing the release of delivery orders and CLINs from the AAVS DataMart.

9. The ARN developed systems (QLM-R and BIFRS-R) provide all the retail data for the Marine RTCs at San Diego and Parris Island. The equivalent data for the other services will be provided to the AAVS DataMart with extractions for service specific systems, e.g., ACIIPS from the Army.

10. The source for much of the AAVS DataMart data is extracted from SAMMS and a number of other systems. SAMMS contains data on retail requisitions, contracts with DAMs, and depot inventory levels for all NSNs. The other data includes such things as DAM names and addresses, DFAS billing addresses, depot identifications, and a wide variety of related data.

11. The AAVS DataMart provides total asset visibility for all retail, wholesale, and manufacturing activities. At the retail level it tracks consumption, demand, and on-hand inventory levels. At the wholesale level it tracks depot supplies by locations. At the manufacturing level it tracks orders, work-in-process, finished goods, and shipments.

12. The VIM (Virtual Item Manager) provides Internet based tools for viewing the status of all processes captured in the AAVS DataMart and for updating parameters used to make decisions throughout the process.

1.2   Computer System Infrastructure

ARN systems (see Figure 1.2-1) are supported by a three-servers production configuration, a single server development (i.e., test) system, a shared battery backup for the production servers,

and an Internet controller for access to the Internet Service Provider over a T1 line. The three production servers support the following:

o AAVS: All databases are kept on this server
o AAVS2: All web and ftp access is provided by this server
o AAVS3: All programs reside on this server

All of the servers utilize Windows NT as their operating system. The database software for both the production and development servers is Microsoft SQL Server 7.0. Verisign provides the encryption protection.
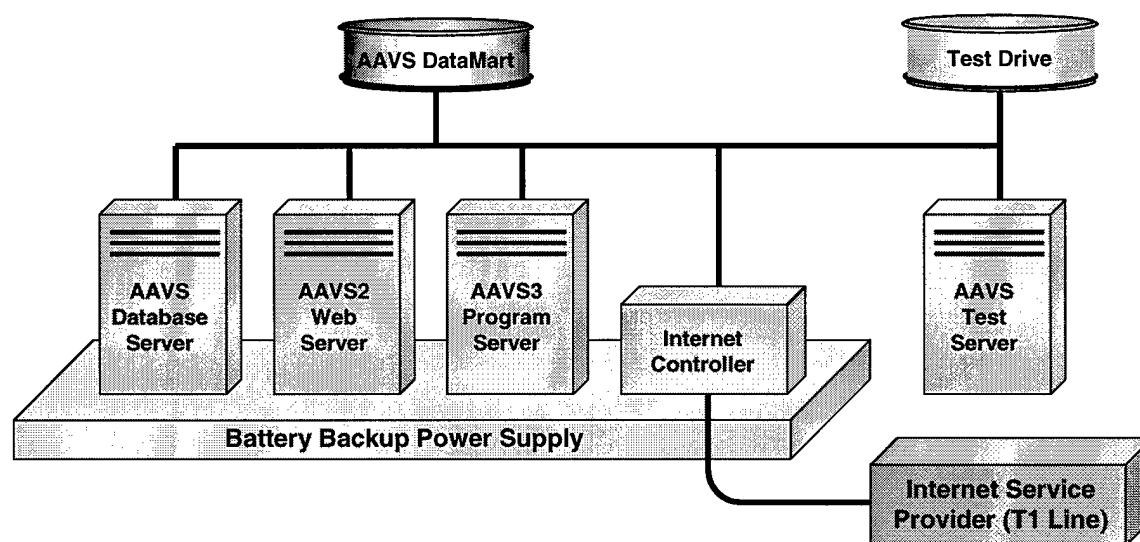

Figure 1.2-1: Computer System Components

2 AAVS DataMart

The ARN Asset Visibility System (AAVS) DataMart is built from a collection of data elements from a variety of legacy systems (see Figure 2-1). This collection of information provides for visibility into the total apparel supply chain. All of the data elements in the AAVS DataMart are documented with a comprehensive data dictionary (see Appendix E "AAVS DataMart Data Dictionary"). The type of data collected from each legacy system is as follows:

1) **ASAP** (Automated Supplier Apparel Production): Apparel manufacturers use this system to capture work-in-process and finished goods inventory counts.

2) **BIFRS-R** (Balanced Inventory Flow Replenishment System – Retail): The Marine Recruit Training Center at Parris Island uses this system to capture inventory and consumption data.

3) **CAGE** (Commercial And Government Entity): The name and addresses of all manufacturers with government contracts is recorded against a unique CAGE code.

4) **CAS** (Contract Administration Services): The name and addresses of all government contract administration offices is recorded against a unique CAS code.

5) **DFAS** (Defense Finance and Accounting Service): The name and addresses of all offices that make payments to defense contractors is recorded against a unique payment office code.

6) **DODAAC** (Department of Defense Activity Address Code): The name and addresses of all government and some contractor offices is recorded against a unique DODAAC code.

7) **QLM-R** (Quality Logistics Management – Retail): The Marine Recruit Training Center at San Diego uses this system to capture inventory and consumption data.

8) **RIC** (Routing Indicator Code): Provides a correlation between the depot identifier (i.e., RIC) and its DODAAC.

9) **SAMMS** (Standard Automated Materiel Management System): DSCP uses this system to record contract data, depot inventory levels, and requisitions from all government retail sites.
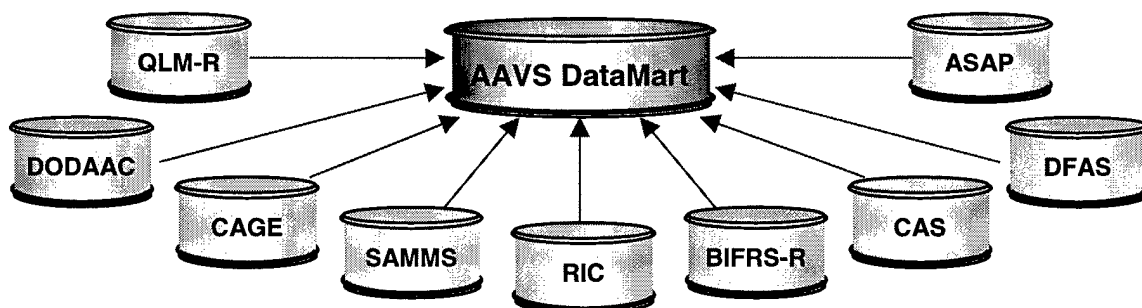
Figure 2-1: AAVS DataMart Sources of Data

2.1 ASAP/Manufacturer's System

The Automated Supplier Apparel Production (ASAP) system is a web-based system that is used by apparel manufacturers to report production status and generate invoices and shipping records.

A nightly extraction is made from the ASAP database to transfer the following information to the AAVS DataMart:

- o CAGE
- o NSN
- o Finished-Goods (FG) Quantity
- o FG Update Date and Time
- o Work-In-Process (WIP) Quantity
- o WIP Update Date and Time

2.2 BIFRS-R/Retail System for Marine Corp RTC at Parris Island

Pertinent data from the RTC in Parris Island is transmitted to the AAVS DataMart using an AAVS ftp site. The data is transmitted in separate tab delimited text files (see Table 2.2-1). The data from these files is loaded into the AAVS DataMart tables named "RetailSummary", "RetailRequisitions", and "RetailReceipts". The DODAAC from the Parris Island RTC is appended to each requisition number so that it can be distinguished from the equivalent data in the same tables from the RTC at San Diego (see Section 2.7).

Table 2.2-1: Data Elements in Text Files from BIFRS-R

Summary File	Requisitions File	Receipts File
NSN	NSN	Location
Quantity On-Hand	Activity Date	NSN
Quantity Received	Requisition Number	Unit of Measure
Quantity Issued	Quantity Ordered	Quantity
DOS		

2.3 CAGE/Manufacturers Identification

The CAGE data is acquired quarterly (CD-ROM for $22.75) from the Defense Logistics Information Service, Freedom of Information Office, 74 Washington Avenue N., Battle Creek, MI 49017-3084. The data that is extracted from this CD-ROM includes:

- o CAGE
- o Company name
- o Number and street
- o City
- o State
- o Zip with dash number
- o Country
- o Phone number
- o Fax number

2.4 CAS/Administered By Offices

The Federal Directory of Contract Administrative Services (CAS) codes are maintained by the Defense Contract Management Command (DCMC). CAS codes are used to identify the office that is responsible for the administrative functions for each contract (Block 10 of the DD 250).

The three digit numeric codes are periodically extracted from a text file from the DCMC web site at: http://www.dcmc.hq.dla.mil/CASBOOK/casbook.htm. DSCP has added to this list with a set of three additional non-standard alpha CAS codes for contracts that are administered in Philadelphia. Standard CAS codes are three digit numbers. The three additional alpha codes are manually entered into the CAS table. The CAS table contains the correlation between the CAS code and its DODAAC.

2.5 DFAS/Pay Office Codes

DFAS identifies their payment offices with a DODAAC and a mailing address that is slightly different than the address found in the DAAS (Defense Automated Addressing System) DODAAC data. DSCP defines the payment office using the SAMMS ACF (Active Contracts File) table with a two character alphanumeric code "PAYMT_OFC_CD". No automated source exists that correlates the DFAS DODAAC with the SAMMS code. The combination of the lack of an automated correlation and the disjoint between the two DODAAC addresses necessitated the creation of a manual table (see Table 2.5-1) that was created by working with DFAS personnel to get accurate information for the DFAS addresses and the SAMMS code correlations. The data was completed using the address information found at DFAS's web site: http://ecweb.dfas.mil/notes.html

DFAS accepts electronic payments using two formats, i.e., SAMMS and MOCAS (Mechanization of Contract Administration System). Pay Codes of 12 and 16 identify the SAMMS formatted invoices while all other codes require MOCAS formatted invoices.

Table 2.5-1: Manually Created Table for DFAS Codes and Addresses

Pay Code	DODAAC	DD 250 Name	DD250 Title	DD250 Address	DD250 City, State Zip
01	SC1020	DFAS Columbus Center	DFAS-CO-JSA/Southeast Division	P.O. Box 182225	Columbus, OH 43218-2225
09	SC1034	DFAS Columbus Center	DFAS-CO-JSC/Capitol Division	P.O. Box 182263	Columbus, OH 43218-2263
12	SC0100	DFAS Columbus Center	DFAS/CO/LSCBA/C&T	P.O. Box 182317	Columbus, OH 43218-6248
16	SC0100	DFAS Columbus Center	DFAS/CO/LSCBA/C&T	P.O. Box 182317	Columbus, OH 43218-6248
A1	SC1020	DFAS Columbus Center	DFAS/-CO-JSA/Southeast Division	P.O. Box 182225	Columbus, OH 43218-2225
A2	SC1016	DFAS Columbus Center	DFAS-CO-JNB/Bunker Hill Division	P.O. Box 182077	Columbus, OH 43218-2077
A3	SC1028	DFAS Columbus Center	DFAS-CO-JWPR	P.O. Box 182317	Columbus, OH 43218-2317
A4	SC1018	DFAS Columbus Center	DFAS-CO-JNF/New Dominion Division	P.O. Box 182041	Columbus, OH 43218-2041
A5	SC1030	DFAS Columbus Center	DFAS-CO-JSD/Chesapeake Division	P.O. Box 182264	Columbus, OH 43218-2264
A7	SC1028	DFAS Columbus Center	DFAS-CO-JWB/Gateway Division	P.O. Box 182251	Columbus, OH 43218-2251
A8	SC1032	DFAS Columbus Center	DFAS-CO-JNC/Minuteman Division	P.O. Box 182266	Columbus, OH 43218-2266
A9	SC1018	DFAS Columbus Center	DFAS-CO/All American	P.O. Box 182317	Columbus, OH 43218-2317
B0	SC1028	DFAS Columbus Center	DFAS-CO-JWB/Gateway Division	P.O. Box 182251	Columbus, OH 43218-2251
B2	SC1032	DFAS Columbus Center	DFAS-CO-JNC/Minuteman Division	P.O. Box 182266	Columbus, OH 43218-2266
B7	SC1004	DFAS Columbus Center	DFAS-CO-JWV/Van Nuys Division	P.O. Box 182157	Columbus, OH 43218-2157
B8	SC1012	DFAS Columbus Center	DFAS-CO-JNA/Liberty Division	P.O. Box 182104	Columbus, OH 43218-2104
B9	SC1010	DFAS Columbus Center	DFAS-CO-JND/Independence Division	P.O. Box 182362	Columbus, OH 43218-2362
C9	SC1030	DFAS Columbus Center	DFAS-CO-JSD/Chesapeake Division	P.O. Box 182264	Columbus, OH 43218-2264
D7	SC1006	DFAS Columbus Center	DFAS-CO-JWT/Santa Ana Division	P.O. Box 182381	Columbus, OH 43218-2381
D9	SC1034	DFAS Columbus Center	DFAS-CO-JSC/Capitol Division	P.O. Box 182263	Columbus, OH 43218-2263
E7	HQ0339	DFAS Columbus Center	DFAS-CO-JWC/West Entitlement Operations	P.O. Box 182381	Columbus, OH 43218-2381
E8	HQ0338	DFAS Columbus Center	DFAS-CO-JSCB/South Entitlement Operations	P.O. Box 182264	Columbus, OH 43218-2264

2.6 DODAAC/Government Addresses

The DODAAC table is built from a very large fixed-column text file that is periodically downloaded from a DAAS (Defense Automated Addressing System) web site with the address: http://daynt6.daas.dla.mil/dodaaf/down_dodaaf.pl. A program was developed to read this file to store the extracted information in a more usable database structure. The resultant file contains

DODAAC addresses for every government and many commercial sites throughout the world. A small number of commercial sites are assigned DODAACs when they are assigned responsibility to act as a depot to store and deliver government owned items.

The vast majority of these DODAACs are of no interest for the AAVS DataMart. For this reason, a second application was developed that runs each day to extract only pertinent DODAACs for the AAVS DataMart. Pertinent DODAACs are defined as:

- o Ship-To sites identified in the SAMMS ACF table
- o Ship-To sites identified in the SAMMS ARCS1* table
- o Ship-From sites identified in the SAMMS ARCS1* table
- o Administered-By offices as defined in the SAMMS ACF table

* There are four related ARCS (Active Requisition Control/Status) tables from SAMMS

2.7   QLM-R/Marine Corp RTC at San Diego

Pertinent data from the RTC in San Diego is transmitted to the AAVS DataMart using an AAVS ftp site. The data is transmitted in separate tab delimited text files (see Table 2.7-1). The data from these files is loaded into the AAVS DataMart tables named "RetailSummary", "RetailRequisitions", and "RetailReceipts". The DODAAC from the San Diego RTC is appended to this data so that it can be distinguished from the equivalent data in the same tables from the RTC at Parris Island (see Section 2.2).

Table 2.7-1: Data Elements in Text Files from QLM-R

Summary File	Requisitions File	Receipts File
NSN	NSN	NSN
Activity Date	Activity Date	Activity Date
Nomenclature	Document Number	Document Number
Unit of Measure	Quantity Requested	Quantity Received
Quantity On-Hand	Requested Due Date	
Quantity Received	Quantity Remaining	
Quantity Issued		
Quantity Adjusted		
Quantity On-Order		
DOS Average		
DOS Predictive		
Unit Cost		
Annual Consumption		
Daily Consumption		
Projected Daily Consumption		

2.8   RIC/Depot Identifiers

The RIC table is built from a very large fixed-column text file that is periodically downloaded from a DAAS (Defense Automated Addressing System) web site with the address: http://daynt6.daas.dla.mil/dodaaf/down_dodaaf.pl. A program was developed to read this file to store the extracted information in a more usable database structure. The resultant file contains a correlation between the RIC and DODAAC for all government depots throughout the world. A

small number of commercial sites are assigned RICs when they are assigned responsibility to act as a depot to store and deliver government owned items.

The vast majority of these RICs are of no interest for the AAVS DataMart. For this reason, a second application was developed that runs each day to extract only pertinent RICs for the AAVS DataMart. Pertinent RICs are defined as:

- o Ship-To sites identified in the SAMMS ACF table
- o Ship-From sites identified in the SAMMS ARCS1 table
- o Storage locations identified in the NIR2 (National Inventory Record) table

2.9 SAMMS/Contract and Product Data

The Item Managers and contracting personnel at the Defense Supply Center in Philadelphia (DSCP) manage their inventories and contracts using a system named SAMMS (Standard Automated Materiel Management System). SAMMS is an IMS mainframe system that resides at DSCC in Columbus, Ohio (see Figure 2.9-1). DSCP in Philadelphia runs a nightly batch extraction to create an Oracle database for only clothing and textile (C&T) items. PDIT in Long Beach receives a nightly batch extraction from the resultant C&T Warehouse to create a SQL Server based database that is loaded into the AAVS DataMart.
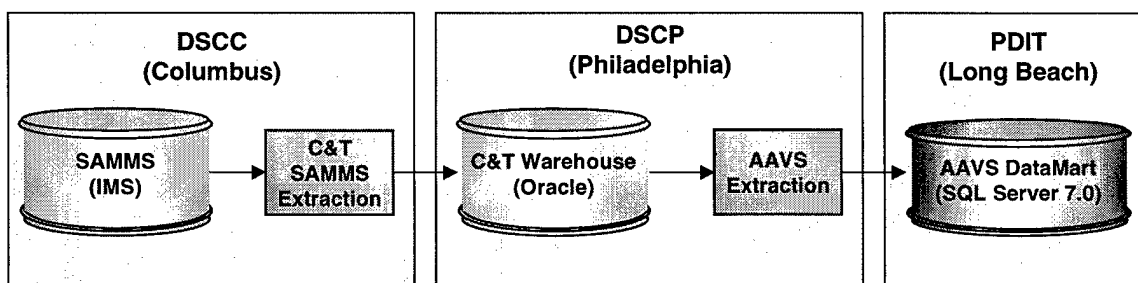
Figure 2.9-1: SAMMS Extraction for the AAVS DataMart

The tables that are currently being extracted from SAMMS for the AAVS DataMart, include:

- o **ACF**: Contains contracting data for currently active contracts for each of the apparel manufacturers, e.g., contract number, NSN, order quantity, ship-to locations, CAS code, payment office code, etc.

- o **ARCS1**: Contains retail requisition data, e.g., requisition number, requestor identification, NSN, order quantity, etc.

- o **ARCS2**: Contains current requisition status information, e.g., requisition number, status code, status date, etc.

- o **ARCS3**: Contains additional requisition status information, e.g., denial code, hold code, etc.

- o **ARCS4**: Contains shipment data for each requisition, e.g., transportation control number, mode of shipment, shipment date, etc.

o **DUE**: Contains due-in information for shipments from depots to retail, e.g., requisition number, depot, order quantity, ship date, etc.

o **NIR**: Contains NSN identification data, e.g., PGC, NSN, service(s) that use the garment, total on-hand issuable quantities, responsible item manager identification, etc.

o **NIR2**: Contains inventory level data for each depot, e.g., NSN, depot identification, depot inventory level, etc.

o **ORCS**: Contains DSCP Item Manager identification, name, and phone number. ORCS is an acronym for Output Routing Codes.

o **SCF**: Contains information about each NSN, e.g., nomenclature, size, consumption history, etc. SCF is an acronym for Supply Control File.

The AAVS Extraction program accesses only a subset of the SAMMS data from the identified tables for insertion into in the AAVS DataMart. The data screening rules used to extract the data include:

o All NSNs that are marked as used by the Marine Corp or Army in the NIR table
o The subset of the above that have a valid PGC in the SCF table
o All contracts in the ACF table that call for any of the above NSNs
o Any of those contracts that are not cancelled, closed, or inactive for more than one year
o All requisitions in the ARCS tables that call for any of the above NSNs
o All depot records in the NIR2 table for any of the above NSNs
o All due-in records in the DUE table for any of the above NSNs

The AAVS DataMart contains a specific subset (See Appendix F "Required SAMMS Data Elements") of the data elements that could be extracted from the SAMMS tables. The specific subset was selected based on the ARN's team knowledge of the use of the data. A list of all SAMMS data elements was circulated to the entire team so each team member could mark the ones they use. The SAMMS data is extracted from an Oracle extraction from SAMMS. The data is screened to only select a specific subset of data that complies with the following

o All NSNs that begin with an FSC of "83" and "84"
o Any NSNs that begin with an FSC of "99" whose nomenclature implies apparel
o All of the above NSNs that are marked as used by the Marine Corp or Army
o All of the above NSNs with non-zero entries in SSC (Standard Supply Code)
o All contracts that require any of the above NSNs
o All requisitions that require any of the above NSNs
o All depot counts for any of the above NSNs

3 AAVS DataMart Extractions

Different subsets of the AAVS DataMart data elements are provided to a variety of ARN team members for a variety of purposes. The customers for these extractions include ATI, LMI, Cal Poly, and Clemson. The data is either "pushed" to a customer's ftp site or provided via an AAVS ftp site for "as required" access and download. Access to the data is controlled with user identifications and passwords.

3.1 QLM-Central/Depot Redistribution System

The AAVS DataMart update process for SAMMS data is initiated at 11:00 PM (all times are Eastern) each day. Each SAMMS table is checked for its update status and then downloaded as soon as it has been updated. QLM-Central is primarily interested in the ACF, NIR, and NIR2 tables. As soon as these tables are downloaded, they are "pushed" to an ATI ftp site for updating the QLM-Central database. They also need updates for the ARCS, DODAAC, and SCF tables, but these are not time critical. As soon as all AAVS DataMart tables are updated, the remaining tables needed by QLM-Central are "pushed" to the ATI ftp site.

3.2 Access via AAVS ftp Site

A variety of custom extractions are prepared and placed in the appropriate AAVS ftp site (see Table 3.2-1) as soon as the nightly AAVS DataMart update process is complete.

Table 3.2-1: AAVS FTP Sites and Content of Files

FTP Site	Data of Interest
AAVS to Cal Poly	Marine Corp inventory counts, requisitions, and contracts
AAVS to DSCP	RTC Requisition Status
AAVS to LMI	Prices and inventory counts
AAVS to BIFRS	All retail requisitions and depot inventory levels
AAVS to QLM	Depot inventory counts

4 System Components

P.D.I.T. has developed four systems that access and/or update data from the AAVS DataMart. The first three (ASAP, ASMweb, and VIM) are Internet browser based systems while the fourth (AAVS) is a client/server application that must be installed on each user's system along with a copy of the AAVS DataMart. The AAVS system is not currently being used. The VIM system has replaced it so that all functions can be invoked using an Internet Browser.

4.1 ASAP – Automated Supplier Apparel Production

ASAP is used by apparel manufacturers to record work-in-process and finished-goods counts and to generated invoices (DD 250s). The system is accessed using an Internet Browser at http://asapweb.pdit.com. The version in use at the end of 1999 (completion date for Delivery Order 0002) was Version 1.4. Only authorized users can log onto the system (see Figure 4.1-1). DSCP has identified the apparel manufacturers that P.D.I.T. authorized to be ASAP users (see Table 4.1-1). A users manual has been developed and released (see Appendix B "ASAP Users Manual")
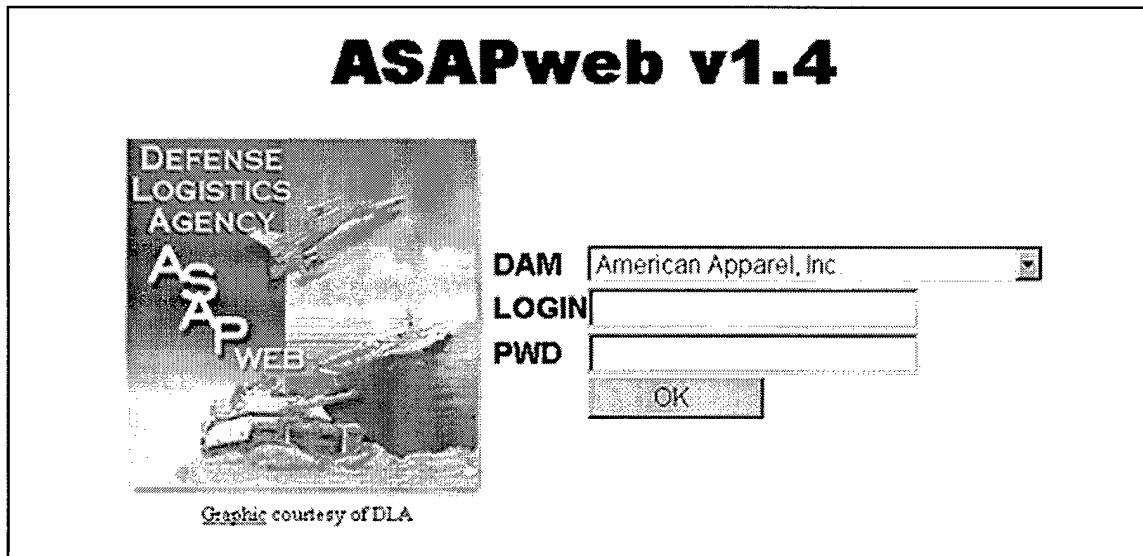
Figure 4.1-1: ASAP User Login Web Page

Table 4.1-1: DSCP Authorized Apparel Manufacturers

Altama Delta	Goodwill Industries Of South Florida	Southeastern Kentucky Rehabilitation
American Apparel	J H Rutter-Rex	Steps, Inc. Southside Training
Belleville Shoe	Jockey International	Tennessee Apparel
Bernard Cap	Lajas Industries	Travis Association For The Blind
Cal Poly	Mc Rae Industries	Uniart Corp
Caribbean Needle Point	Mitts Nitts	Unicor
Crown Clothing	National Industries For The Blind	Union Underwear
DJ Mfg Corp	Park Manufacturing	Vocational Guidance Services
EA Industries	Propper Intl	Wellco Enterprises
Equa Industries	Soffe M J Co	

Once users are logged on to ASAP, they are presented with the option to perform any of eight functions (see Figure 4.1-2). Each ASAP user's work-in-process and finished-goods counts are available in the AAVS DataMart as a segment of the total supply chain visibility.

Figure 4.1-2: Functions Supported By ASAP

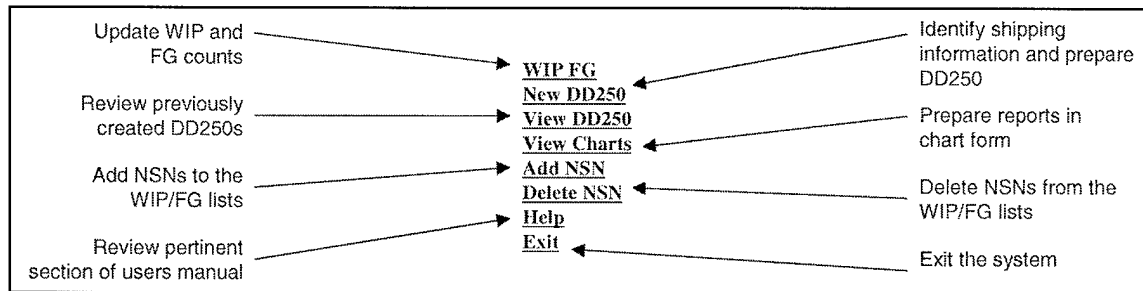- **WIP FG**: Provides a custom list for each authorized apparel manufacturer that includes all PGCs and NSNs that have been identified in recent contracts. Each manufacturer enters counts for Work-In-Process and Finished-Goods for each of the NSNs.

- **New DD250**: Extracts data from the AAVS DataMart that is used to complete nearly all blocks in the DD250, e.g., ship-to address, payment will be made by address, discount terms, unit price, requisition number, NSN, CLIN, etc. (see Figure 4.1-3). This function uses pull-down lists and data entry fields to identify the quantities being delivered at this time for specific CLINs. Once satisfied with the data, the user can have it all formatted and printed as a DD250.

- **View DD250**: This function permits each manufacturer to retrieve and review previously created DD250s.

- **View Charts**: This function permits each manufacturer to generate and print a variety of charts (pie, bar, etc.) of the current WIP and FG counts.

- **Add NSN**: Manufacturers may wish to build and track NSNs for which they have no recent contracts. This function permits them to add any valid NSN to the list of NSNs they track even if they have no recent contract for that NSN.

- **Delete NSN**: Manufacturers may reverse the addition of NSNs by deleting those NSNs from the list of items they track.

- **Help**: The "Help" function understands what function the user is currently operating so that a click of the "Help" button causes the pertinent section of the users manual to be displayed.

- **Exit**: This function causes a return of control to the login page.

A complete
DD250 can be
prepared from
the minimal
input because
most of the data
is extracted from
the AAVS
DataMart

Figure 4.1-3: Example of a Minimal Data Entry Required to Complete a DD Form 250

4.2 ASM – Apparel Supplier Management

ASM can be used by apparel manufacturers who are responsible for item management, production, warehousing, and the distribution for specific garments. The system is accessed using an Internet Browser at http://asmweb.pdit.com. The version in use at the end of 1999 (completion date for Delivery Order 0002) was Version 1.0. The initial user of ASMweb is Seagoing Apparel. They have requested a number of changes to the system to accommodate their specific requirements. A proposal has been developed and submitted to Seagoing for their consideration. A users manual has been developed and released (see Appendix C "ASMweb Users Manual"). ASM provides a closed-loop system that communicates and integrates data from DSCP across the prime contractor's responsibilities for manufacturing, warehousing, and retailing operations (see Figure 4.2-1).
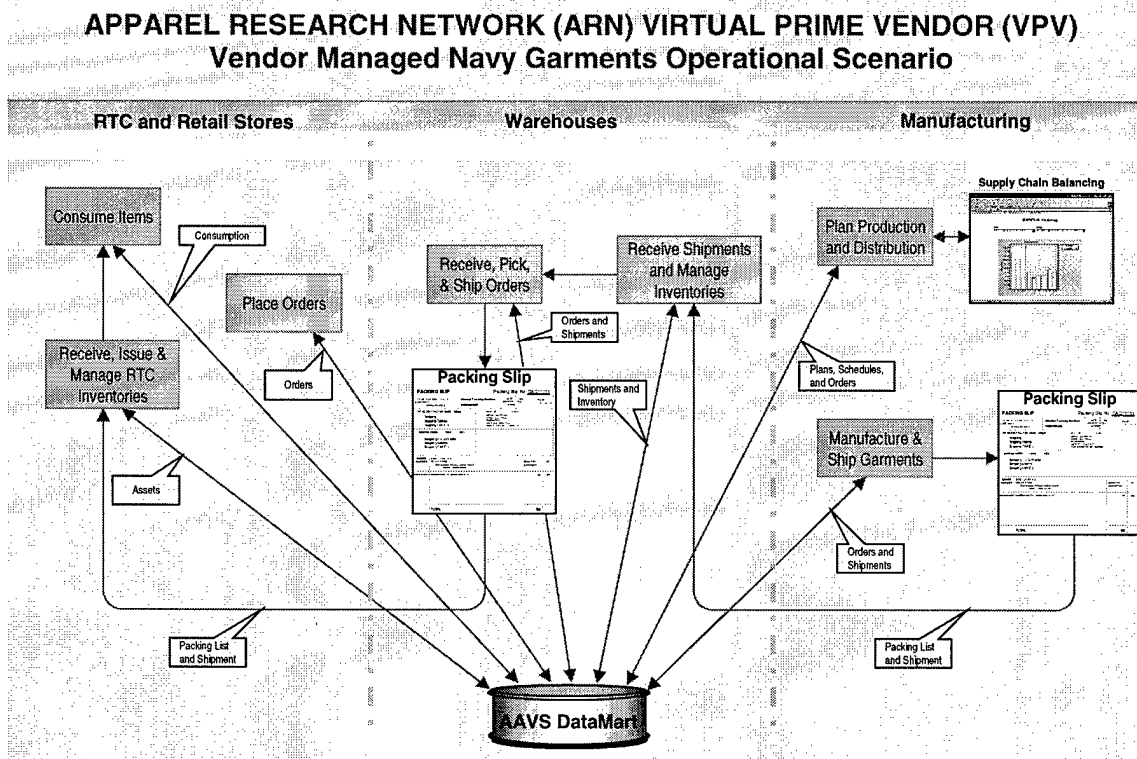
Figure 4.2-1: Processes Addressed by ASM

ASM provides support for manufacturing, warehousing, and retailing using a series of functions and subfunctions (See Figure 4.2-2). The manufacturing functions supports production planning, allocation of work to subcontractors, shipping of completed work, and invoicing. The warehousing functions support material receiving, cycle counting, and the processing and shipment of orders from retail sites. The retail functions support either recruit training center operations or the replenishment of stock at retail stores. The source of the foundation data is the AAVS DataMart that gets all of the product and contract data from a variety of sources, including SAMMS, DODAAC, CAS, CAGE, and a variety of other systems.

ASMweb Functions	ASMweb Function Explanations
Manufacturing	The indented functions below are used to support the manufacture of all ordered items
Prime Contractor Planning	The indented functions below are used by the prime contractor to plan and allocate production
Plan Production	Permits prime contractor personnel to decide which NSNs need to be produced to balance entire supply chain
Allocate Production	Permits the allocation of the required NSNs to the appropriate production facility
Create Unplanned Production Order . .	Permits the periodic entry of individual production orders independent of the regular planning cycle
Identify Capacity (Max Qry)	Permits the prime contractor to identify maximum production capacities for each production facility
Contractor/Subcontractor Production	The indented functions below are used by the contractor and subcontractors to initiate and ship orders
Start Production of Orders	Permits each production facility to access their allocated orders and initiate production
Ship Orders	Prepares packing slips and shipping labels for each shipment once production is complete
Generate Invoices	Prepares DD 250s for all items that have been transferred to retail sites since the last invoice
Warehousing	The indented functions below are used to process orders at the each of the warehouses
Receive Materials	The indented functions below are used to support the processing of order receipts
Record Receipts	Permits the recording of receipts which updates the on-hand inventories at each warehouse
Adjust Receipts	Permits mistakes to be corrected from the incorrect recording of receipts
Adjust Quantity On-Hand	Permits quantities o.n-hand to be adjusted for any reason, e.g., damaged items
Filling Retail Orders	The indented functions below are used when processing orders to be delivered to retail sites
Generate Pick List	Permits all orders to be viewed and selectively processed for shipment via a pick list
Ship Retail Orders	Permits selected orders to be recorded as shipped along with the appropriate packing slip
Update Warehousing Parameters	Permits the definition of warehousing related parameters
Identify Warehouses	Permits new warehouses to be added and identified
Assign Retail Sites to Warehouses . . .	Permits the identification of the warehouse that supports each retail site
Recruit Training Center	**The indented functions below are used exclusively for the Navy's Great Lakes Recruit Training Center**
Monitor Order Status	Permits personnel to monitor the status of orders from their initiation through each shipper's tracking systems
Enter Consumption	Permits personnel to enter daily or weekly consumption for each NSN for each week of the year
Place Order	Provides visibility into supply data and order parameters to permit the entry of reorders for all NSNs
Record Receipts	Provides list of open reorders to record their receipt
Adjust Receipts	Permits call-back of recorded receipts of reorders to correct mistakes that were subsequently discovered
Adjust Quantity On-Hand	Permits adjustments to on-hand inventory levels
Update RTC Parameters	Provides visibility into recruit forecasts and consumption to record order parameters for each NSN
Retail Stores	**The indented functions below are used exclusively for the Navy's retail stores**
Replenish Stock	Provides support for the entry of replenishment orders for each of the Navy's retail stores
Record Receipts	Permits retail orders to be reviewed and recorded as received once the order arrives
Update Retail Parameters	Permits the identification of retail related parameters
Reports	**Provides a variety of reports to review the data created within the other functions**
Warehouse Code List	Lists all of the warehouses and their codes
Retail Site Code & Warehouse List. . . .	Lists all of the retail sites, their codes, and the warehouse that supports them
Demand History By Retail Store	Provides a graph showing the past twelve months consumption for each retail site and garment type
Help	**Provides point of contact information to get any needed assistance**

Figure 4.2-2: Indentured List of ASM Functions and Descriptions

4.3   VIM – Virtual Item Manager

The current version of VIM supports seven different functions (see Figure 4.3-1). The functions can be used by DSCP and RTC personnel to analyze data from the AAVS DataMart and to make specific decisions. The system is accessed using an Internet Browser at http://vim.pdit.com. VIM contains both "straw man" concept functions as well as production functions that can be used on a daily basis. The following subsections describe each of these functions.
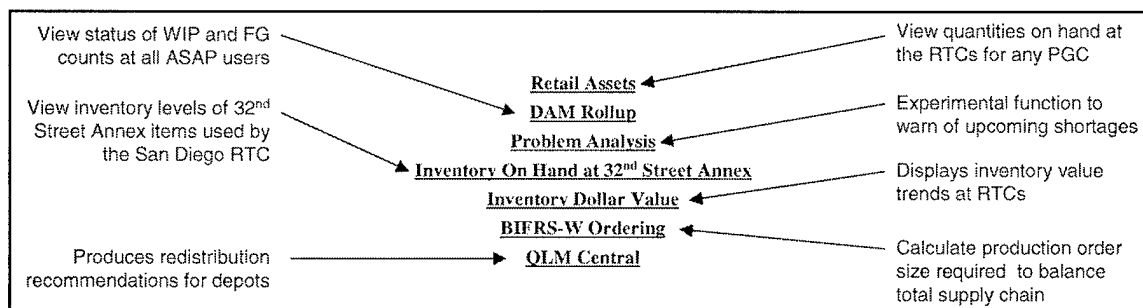

Figure 4.3-1: VIM Functions

4.3.1   VIM – Retail Assets

The VIM Retail Assets function provides visibility into inventory and order status for each of the recruit training centers that are in the AAVS DataMart (see Figure 4.3.1-1).

Retail Customer	PGC	NSN	
M00243 San Diego MCRD ▼	01876 Shirt,man's ▼	8405011734451 ▼	search

Retail Summary

Activity for Week Ending	On Hand Qty	Issued Qty	Requisitioned Qty	Received Qty	Days of Supply
01/03/2000	182	0	0	0	

Retail Requisitions

Run Date	Requisition Number	Requisition Qty	Requested Due Date
12/07/1999	M0024393401098	60	12/09/1999
10/18/1999	M0024392911263	60	11/02/1999

Retail Receipts

Run Date	Requisition Number	Received Qty
12/14/1999	M0024393401098	60
11/02/1999	M0024392911263	60

Figure 4.3.1-1: Sample Retail Assets Web Page

4.3.2   VIM – DAM Rollup

The VIM DAM (Defense Apparel Manufacturer) Rollup function provides visibility into finished-goods and work-in-process inventory levels at each of the apparel manufacturers that utilize ASAP (see Figure 4.3.2-1).

PGC							NSN	
02253 Coat, enhanced hwbdu ▼							ALL ▼	search

Manufacturer	Cage Code	NSN	Size	Finished Goods Qty	Finished Goods AsofDate	Work in Progress Qty	Work in Progress AsofDate
Ea Industries/Edcar Industries Inc	8U017	8415-01-390-8537	xsmall xshort	150	09/27/1999	0	09/27/1999
Ea Industries/Edcar Industries Inc	8U017	8415-01-390-8538	xsmall regular	0	09/27/1999	0	09/27/1999
Ea Industries/Edcar Industries Inc	8U017	8415-01-390-8539	small short	420	09/27/1999	0	09/27/1999
Ea Industries/Edcar Industries Inc	8U017	8415-01-390-8540	small xlong	0	09/27/1999	0	09/27/1999
Ea Industries/Edcar Industries Inc	8U017	8415-01-390-8541	medium xshort	240	09/27/1999	396	09/27/1999
Ea Industries/Edcar Industries Inc	8U017	8415-01-390-8542	medium xxshort	6	09/27/1999	0	09/27/1999

Figure 4.3.2-1: Sample DAM Rollup Web Page

4.3.3 VIM – Problem Analysis

The VIM Problem Analysis function is a "straw man" function meant to initiate discussions of how the AAVS DataMart data could be used to perform exception based problem analysis (see Figure 4.3.3-1).
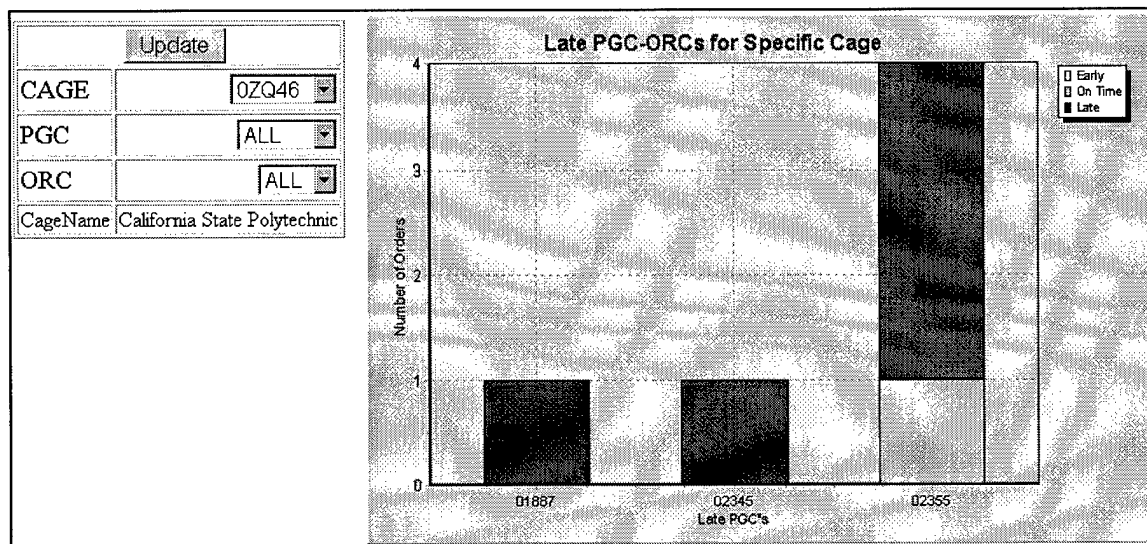

Figure 4.3.3-1: Sample Problem Analysis Web Page

4.3.4 VIM – Inventory On-Hand at 32nd Street Annex

The VIM Inventory On-Hand at 32nd Street Annex function provides visibility into on-hand inventory levels at the depot (32nd Street Annex) and in QLM (San Diego Marine Corp RTC) (see Figure 4.3.4-1).

PGC	Nomenclature	Size	NSN	Depot On Hand Qty	QLM On Hand Qty	QLM As of Date
17632	Bag,duffel		8465-01-117-8699	3,828	1,906	01/03/2000
02051	Belt,man's coat	32 inch	8405-01-279-5566	73	13	01/03/2000
02051	Belt,man's coat	36 inch	8405-01-279-5569	190	1	01/03/2000
02051	Belt,man's coat	38 inch	8405-01-279-5571	76	37	01/03/2000
02051	Belt,man's coat	44 inch	8405-01-279-5576	270	64	01/03/2000
00104	Belt,trousers	45 inch	8440-01-167-7246	14	4,578	01/03/2000
01895	Boots,combat	12 1/2 R	8430-01-198-1336	54	0	01/03/2000
01895	Boots,combat	12 1/2 W	8430-01-198-1337	226	0	01/03/2000

Figure 4.3.4-1: Sample Inventory On-Hand at 32nd Street Annex Web Page

4.3.5 VIM – Inventory Dollar Value

The VIM Inventory Dollar Value function provides visibility into the total on-hand inventory levels at the Marine Corp RTCs at San Diego and Parris Island and at the depot (32nd Street Annex) that supports the San Diego RTC (see Figure 4.3.5-1).
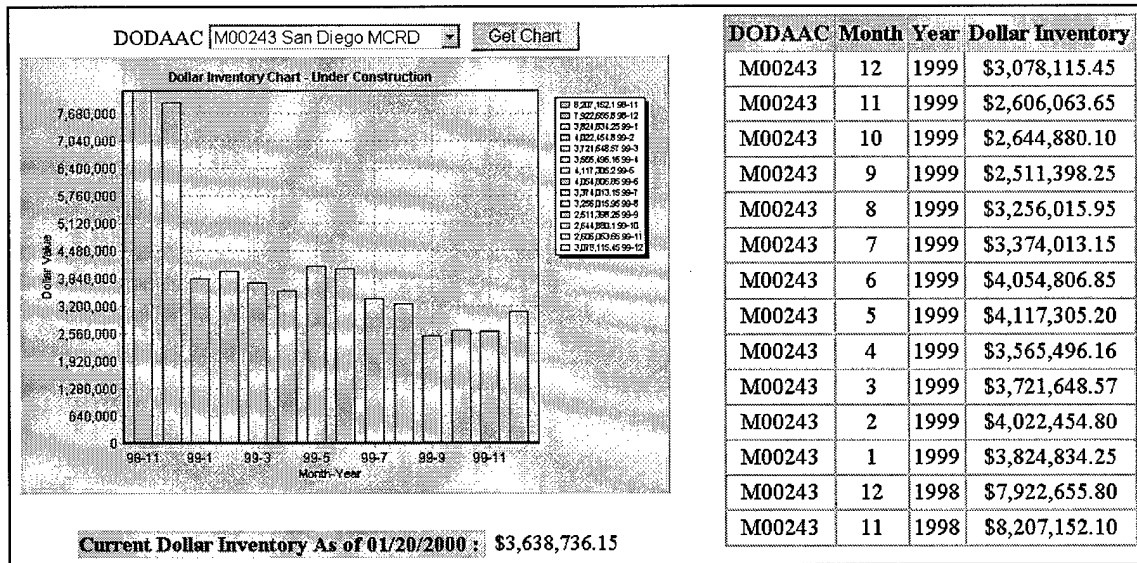
DODAAC	Month	Year	Dollar Inventory
M00243	12	1999	$3,078,115.45
M00243	11	1999	$2,606,063.65
M00243	10	1999	$2,644,880.10
M00243	9	1999	$2,511,398.25
M00243	8	1999	$3,256,015.95
M00243	7	1999	$3,374,013.15
M00243	6	1999	$4,054,806.85
M00243	5	1999	$4,117,305.20
M00243	4	1999	$3,565,496.16
M00243	3	1999	$3,721,648.57
M00243	2	1999	$4,022,454.80
M00243	1	1999	$3,824,834.25
M00243	12	1998	$7,922,655.80
M00243	11	1998	$8,207,152.10

Figure 4.3.5-1: Sample Inventory Dollar Value Web Page

4.3.6   VIM – BIFRS-W Ordering

The VIM BIFRS-W Ordering function utilizes total supply chain inventory counts, historical consumption patterns, and negotiated production levels to calculate production recommendations for the item manager responsible for specific PGCs (see Figure 4.3.6-1). A "Balance Ratio" is calculated from a tariff and is directly proportional to days of supply. The smallest "Balance Ratio" for a given size is the one in most need of re-supply.
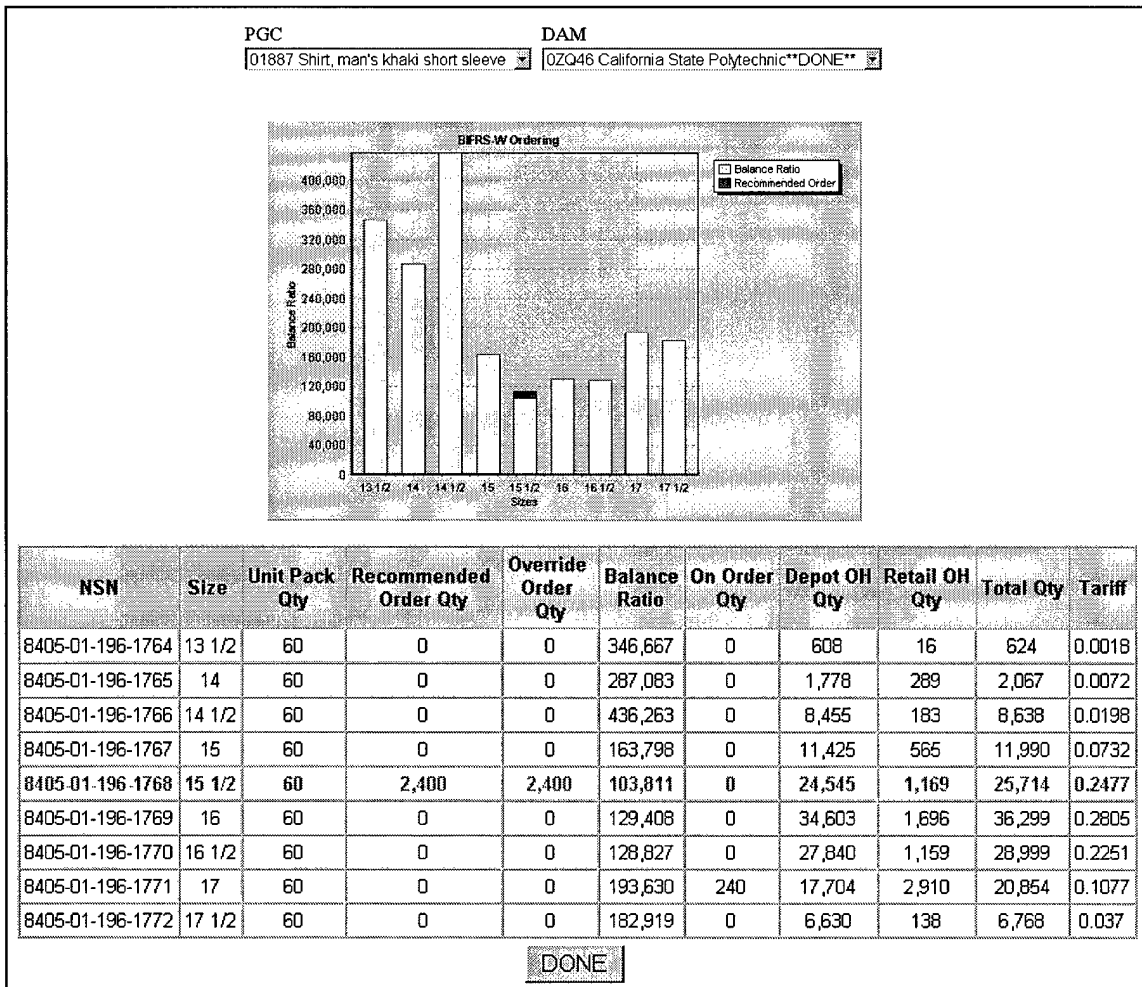
PGC   **DAM**

NSN	Size	Unit Pack Qty	Recommended Order Qty	Override Order Qty	Balance Ratio	On Order Qty	Depot OH Qty	Retail OH Qty	Total Qty	Tariff
8405-01-196-1764	13 1/2	60	0	0	346,667	0	608	16	624	0.0018
8405-01-196-1765	14	60	0	0	287,083	0	1,778	289	2,067	0.0072
8405-01-196-1766	14 1/2	60	0	0	436,263	0	8,455	183	8,638	0.0198
8405-01-196-1767	15	60	0	0	163,798	0	11,425	565	11,990	0.0732
8405-01-196-1768	15 1/2	60	2,400	2,400	103,811	0	24,545	1,169	25,714	0.2477
8405-01-196-1769	16	60	0	0	129,408	0	34,603	1,696	36,299	0.2805
8405-01-196-1770	16 1/2	60	0	0	128,827	0	27,840	1,159	28,999	0.2251
8405-01-196-1771	17	60	0	0	193,630	240	17,704	2,910	20,854	0.1077
8405-01-196-1772	17 1/2	60	0	0	182,919	0	6,630	138	6,768	0.037

DONE

Figure 4.3.6-1: Sample BIFRS-W Ordering Web Page

4.3.7 VIM – QLM/Central

The VIM QLM Central function provides a hyperlink to the web site being developed by AdvanTech to support the redistribution of inventory to depots to support each sites retail demand pattern (see Figure 4.3.7-1).

Welcome to QLM/Central

Please enter your user name and password to continue.

| Name | |
| Password | |

[Login] [Reset]

Figure 4.3.7-1: Sample QLM Central Web Page

4.4 AAVS – ARN Asset Visibility System

The purpose of AAVS is to provide Defense Logistics Agency (DLA) personnel with a data access and analysis tool that permits each user to collect and organize data from either a single or from across a number of databases (e.g. SAMMS, MUMMS, and many others). The data can be collected using very flexible queries into one or more databases and one or more tables from within those databases (see Appendix D "AAVS Users Manual"). DSCP personnel are not currently using this client-server based system. They prefer to use the web-based tools described in Sections 4.1 through 4.3.

AAVS overcomes problems users have with utilizing these databases where their access is typically limited to a predefined set of screens and no capability to integrate data across systems. The goal is to access related information in different tables or between different databases. The common practice for using these databases to perform analysis is to view data one screen at a time, record a subset of the screen data on paper, access another screen, record that data, and then continue the process until all the desired data is manually recorded and organized. AAVS eliminates the need for this practice by providing automated tools for accessing the desired subset of the data, organizing the presentation and sequencing of that data, and then exporting that data to a spreadsheet or another database that only contains the desired subset of data.

A sample of a completed AAVS database access and table correlation is shown in Figure 4.4-1. Two SAMMS tables were placed in separate Data Windows and linked by their common data element, i.e., PGC. The data is displayed in the form of two spreadsheets (one for each table at the bottom of the screen) and a list of selected Data Fields (upper right hand side). The original SAMMS data contained thousands of records. A query was processed to examine only those records with a quantity (QTY) greater that 100,000. The data was also sorted by quantity in ascending order. The sixth record in the first spreadsheet has been clicked with the system automatically repositioning the second spreadsheet to the corresponding record as linked by their PGCs.

Figure 4.4-1: Sample AAVS View of Two Related Tables

5 AMA Standards Development

The Apparel Manufacturing Architecture (AMA) was an ARN sponsored project that was responsible for developing defense apparel supply chain process and data models. The project was directed by Georgia Tech (GT) with support from a variety of ARN participants, including Clemson and PDIT. The following tasks were performed by PDIT to provide support for the AMA efforts:

a) Map the Clemson developed process model of the DSCP Item Managers activities to the GT AMA model.

b) Evaluate the capabilities of the GT developed AIMS (Apparel Information Management System) software and map its functions to the AMA models.

c) Develop a Cal Poly shop floor model and evaluate AIMS in light of that model.

d) Review and provide markups of the AMA process models to GT.

e) Review and provide STEP based markups of the AMA data models to GT.

The AMA process/functional models covered the ARN scope, however, they were fairly high-level. The data models were a mixture of abstract to physical definitions and not consistent within the ARN scope. The AIMS software was assessed for its capability to address each of the Cal Poly performed apparel production functions. The assessment is shown in Table 5-1.

Table 5-1: Apparel Manufacturing Functions Addressed by AIMS

Function	Supported	Function	Supported
1. Accounts Payable	No	12. Packaging Plan	No
2. Accounts Receivable	No	13. Pattern Development	No
3. Bidding/Contracts	No	14. Performance/Status Tracking	No
4. Bill of Materials	No	15. Pick Tickets	No
5. Bundle Labels	No	16. Piece Tickets	No
6. Cutting	Yes	17. Procurement	No
7. Finished Goods Inventory Control	No	18. Raw Materials Inventory Control	No
8. Inspection Plans	No	19. Receiving/Receiving Inspection	No
9. Invoicing	Yes	20. Scheduling	No
10. Marker Development	No	21. Shipping	No
11. Order Entry	Yes	22. WIP Tracking	No

6 Conclusions

PDIT has made significant progress in its efforts to achieve its primary objective to build a complete supply chain database from a collection of heterogeneous legacy system databases and to make this data available over the Internet for anyone with an interest in some facet of the total supply chain. Progress can be seen through the following accomplishments:

1. An AAVS operational and computer system architecture has been put in place to support the construction and access to the AAVS DataMart.

2. The AAVS DataMart has been established as the repository for all Marine Corp apparel supply chain data. The repository contains data about contracts, requisitions, inventory levels (wholesale, retail, and manufacturing), depots, billings, addresses, retail consumption, production status, shipments, etc.

3. Data required by AAVS and other systems can be either imported or exported between systems.

4. Application systems have been developed that both use existing and supply new data that is needed to manage the total supply chain.

While much progress has been, much work remains to be done to achieve the potential savings and improvement in apparel management, production, and distribution. During the next contract period, PDIT will make the following expansions and improvements:

1. Expand the AAVS DataMart beyond the Marine Corp to include apparel data for the rest of the services, i.e., Army, Navy, Air Force, and the rest of the DoD.

2. Expand the capabilities of ASAP to provide support for:

   a) The electronic transmission of invoices (i.e., DD Form 250) from each apparel manufacturer to DFAS

   b) The electronic transmission of new delivery orders (i.e., DD Form 1155) from DSCP to each apparel manufacturer

   c) The electronic transmission of new requisitions (i.e., DD Form 1348-1A "MRO") from each requestor via DSCP to each "Bill & Hold" manufacturer

   d) The electronic transmission of status transactions (i.e., MILSTRIP) from "Bill & Hold" manufacturers to DSCP via SAMMS

   e) The generation of all the labels required for the shipping, intermediate, and individual containers

   f) The tracking of shipments for those carriers that provide on-line tracking data

3. Improve the quality and completeness of the AAVS DataMart by implementing more advanced structure and data mapping methods and tools.

4. Provide for the following expanded VIM capabilities to improve data access and decision support:

   a) Provide each DSCP Item Manager with summarized DD 250 data that displays the production and shipment status of each delivery order on every contract.

   b) Provide each DSCP Item Manager with the last twelve month's of retail consumption data and their resultant tariffs.

   c) Provide each DSCP Item Manager with a decision support tool that utilizes total supply chain inventories and retail consumption patterns to recommend the optimal mix of sizes to rebalance that total supply chain.

   d) Provide a contracts officer controlled tool that makes new delivery orders available to each manufacturer.

   e) Develop a new series of data quality tools that highlight data accuracy and consistency problems for each DSCP Item Manager.

   f) Provide a decision support tool for each DSCP Item Manager that utilizes total supply chain inventories, retail consumption patterns, and total supply chain inventory level goals to recommend new or modified contract minimums.

   g) Provide a decision support tool for each DSCP Item Manager that examines unexpected shortages or low inventory levels to divert existing unshipped CLINs from their planned location to a site that has a more critical need.

5. Improve system reliability with backup power, automatic 24 hour per day phone calls whenever the system detects a failure, and improved SAMMS extraction methods.

6. Build systems using more formalized system acceptance and testing methodologies to move towards eventual turn-over of system sustaining responsibilities to DSCP.